Squire®

Stainless Steel Indirect Water Heater

Installation & Operation Manual

Models: SDT/SET065 - 119

SDT
Solar Dual Coil Tank

SET
Solar Electric Tank

Lochinvar®
High Efficiency Water Heaters, Boilers and Pool Heaters

⚠ WARNING This manual must only be used by a qualified heating installer / service technician. Read all instructions before installing. Perform steps in the order given. Failure to comply could result in severe personal injury, death, or substantial property damage.

Save this manual for future reference.

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Hazard definitions

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels or to important information concerning the life of the product.

⚠ DANGER DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTICE NOTICE indicates special instructions on installation, operation, or maintenance that are important but not related to personal injury or property damage.

Please read before proceeding

⚠ WARNING **Installer –** Read all instructions before installing. Perform steps in the order given.

Have this indirect water heater serviced/inspected by a qualified service technician, at least annually.

Failure to comply with the above could result in severe personal injury, death or substantial property damage.

NOTICE When calling or writing about the appliance – Please have the indirect water heater model and serial number from the indirect water heater rating plate.

Consider piping and installation when determining appliance location.

Any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

Factory warranty (shipped with appliance) does not apply to appliances improperly installed or improperly operated.

⚠ WARNING If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

This appliance MUST NOT be installed in any location where gasoline or flammable vapors are likely to be present.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

⚠ WARNING Failure to adhere to the guidelines on this page can result in severe personal injury, death, or substantial property damage.

When servicing the indirect water heater –

- To avoid severe burns, allow the appliance to cool before performing maintenance.

Indirect water heater operation –

- Should overheating occur or gas supply fail to shut off, do not turn off or disconnect electrical supply to circulator. Instead, shut off the gas supply at a location external to the appliance.
- Do not use this appliance if any part has been under water. The possible damage to a flooded appliance can be extensive and present numerous safety hazards. Any appliance that has been under water must be replaced.

The following chart details the relationship of water temperature and time with regard to scald injury and may be used as a guide in determining the safest water temperature for your applications.

APPROXIMATE TIME / TEMPERATURE RELATIONSHIPS IN SCALDS	
120°F	More than 5 minutes
125°F	1 1/2 to 2 minutes
130°F	About 30 seconds
135°F	About 10 seconds
140°F	Less than 5 seconds
145°F	Less than 3 seconds
150°F	About 1 1/2 seconds
155°F	About 1 second

Hot Water Can Scald!

- Water heated to temperatures for clothes washing, dish washing, and other sanitizing needs can scald and cause permanent injury.
- Children, elderly, and infirm or physically handicapped persons are more likely to be permanently injured by hot water. Never leave them unattended in a bathtub or shower. Never allow small children to use a hot water tap or draw their own bath.
  - If anyone using hot water in the building fits the above description, or if state laws or local codes require certain water temperatures at hot water taps, you must take special precautions:
    - Use lowest possible temperature setting.
    - Install some type of tempering device, such as an automatic mixing valve, at hot water tap or water heater. Automatic mixing valve must be selected and installed according to valve manufacturer's recommendations and instructions.
- Water passing out of drain valves may be extremely hot. To avoid injury:
  - Make sure all connections are tight.
  - Direct water flow away from any person.

Protection Must Be Taken Against Excessive Temperature and Pressure!
--Installation of a Temperature & Pressure (T&P) relief valve is required.

1 General Information

The Lochinvar SDT/SET series indirect water heater (FIG. 1-1) is designed to generate domestic hot water in conjunction with a solar panel using forced circulation with a backup heat source. This indirect water heater consists of a 316L Stainless Steel tank in which a smooth 304L stainless steel coil is located (Table 1A). Solar heating fluid is pumped through the coil and heats the water in the tank. If the solar panel cannot produce enough heat, the backup source should supply hot water. This tank is not intended for use in pool heating applications or for heating any fluid other than water. It is also not intended for use in gravity hot water heating systems.

Operating Restrictions:

- Maximum domestic hot water temperature is 194°F.
- Maximum boiler water temperature is 210°F.
- Maximum working pressure for the vessel tank is 150 psig.

Table 1A
Component Materials

Component	Material
Tank	316L Steel Stainless Steel
Coil	304L Stainless Steel
Insulation	Polyurethane
Jacket	ABS

Single-Wall Heat Exchanger

National Standard Plumbing Code

Single-wall heat exchangers in water heaters comply with the National Standard Plumbing Code provided that:

- boiler water (including additives) is practically non-toxic, having a toxicity rating or class of 1, as listed in Clinical Toxicology of Commercial Products, and
- boiler water pressure is limited to a maximum of 30 psig by approved relief valve.

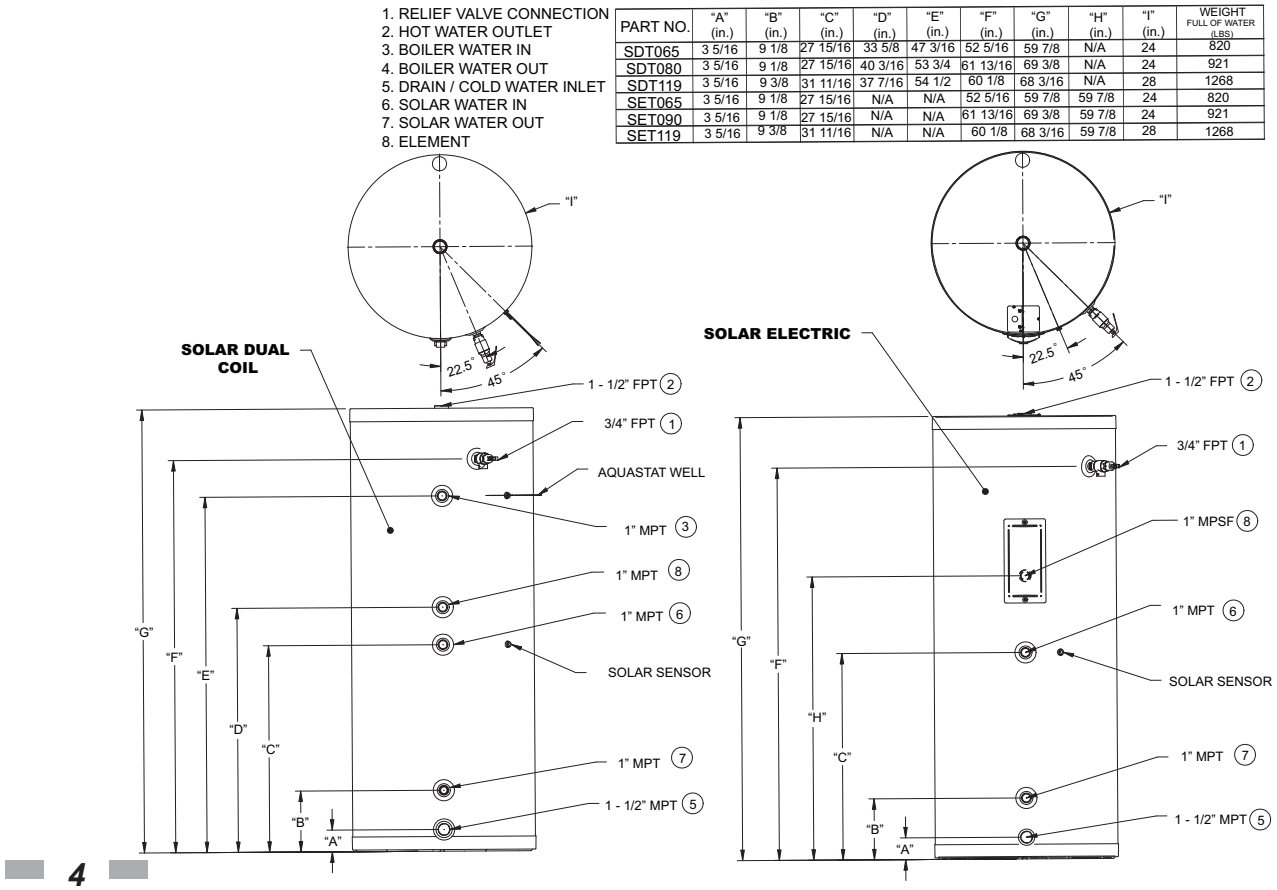
Uniform Plumbing Code

Single-wall heat exchangers are permitted if they satisfy all of the following requirements --

1. The heat transfer medium is potable water or contains only substances which are recognized as safe by the U.S. Food and Drug Administration.
2. The pressure of the heat transfer medium is maintained less than the normal minimum operating pressure of the potable water system.
3. The equipment is permanently labeled to indicate that only additives recognized as safe by the FDA shall be used in the heat transfer medium.

Other heat exchanger designs may be permitted where approved by the Administrative Authority.

Figure 1-1 *Lochinvar SDT and SET Series Indirect Water Heaters*



PART NO.	"A" (in.)	"B" (in.)	"C" (in.)	"D" (in.)	"E" (in.)	"F" (in.)	"G" (in.)	"H" (in.)	"I" (in.)	WEIGHT FULL OF WATER (LBS)
SDT065	3 5/16	9 1/8	27 15/16	33 5/8	47 3/16	52 5/16	59 7/8	N/A	24	820
SDT080	3 5/16	9 1/8	27 15/16	40 3/16	53 3/4	61 13/16	69 3/8	N/A	24	921
SDT119	3 5/16	9 3/8	31 11/16	37 7/16	54 1/2	60 1/8	68 3/16	N/A	28	1268
SET065	3 5/16	9 1/8	27 15/16	N/A	N/A	52 5/16	59 7/8	59 7/8	24	820
SET090	3 5/16	9 1/8	27 15/16	N/A	N/A	61 13/16	69 3/8	59 7/8	24	921
SET119	3 5/16	9 3/8	31 11/16	N/A	N/A	60 1/8	68 3/16	59 7/8	28	1268

2 Pre-installation

1. The installation must conform to the instructions in this manual and all applicable local, state, provincial, and national codes, laws, regulations, and ordinances. Installations in Canada must conform to B149.2 Installation Code.

2. Be certain the domestic water supply to the tank has physical and chemical characteristics that fall within the limits shown in Table 2A. Where questions exist as to the composition of the water on the job, a qualified water treatment expert should be consulted.

CAUTION Water with characteristics outside the limits shown in Table 2A may severely shorten the life of the tank due to corrosion. Damage to tanks in such cases is not covered under warranty.

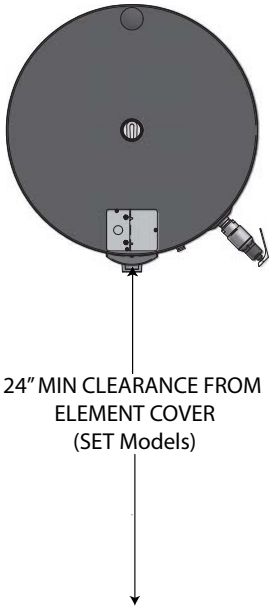
3. Read and understand all installation requirements in this manual.

Table 2A
Water Chemistry Requirements

Water used in the tank must have characteristics falling within the following limits:

Characteristic	Min.	Max.
Ph	6.0	8.0
Chloride (PPM)	--	80

Figure 2-1 *Element Cover Clearances*



Locating the Tank

1. Choose a location for your water heater centralized to the piping system. You must also locate the SDT/SET water heater where it will not be exposed to freezing temperatures. Additionally, you will need to place the water heater so that the controls, drain, and inlet/outlets are easily accessible. This appliance must not be installed outdoors, as it is certified as an indoor appliance, and must also be kept vertical on a level surface.

2. Keep distance between boiler and water heater to a minimum to:
   a. reduce piping heat loss
   b. provide minimal friction loss

3. Figure 1-1 on page 4 shows the weights of all the tanks filled with water. Make sure that the location chosen for the tank is capable of supporting it.

CAUTION This appliance must be placed where leakage from the relief valve, leakage from the related piping, or leakage from the tank or connections, will not result in damage to the surrounding areas, or to the lower floors of the building. A water heater should always be located in an area with a floor drain or installed in a drain pan suitable for water heaters. Lochinvar shall not be held liable for any such water damage.

4. The tank may be located some distance from the boiler provided the pump is designed to provide the flow called for in Table 3B (page 7)- Pressure Drop Values, through the coil. The further the tank is from the boiler, the longer the response of the boiler will be to a call from the tank zone. Insulate piping between the boiler and the tank.

⚠ WARNING Failure to properly support the tank could result in property damage or personal injury.

Recommended Clearances

The installation location must provide adequate clearances for servicing and proper operation of the water heater. A 12 inch vertical clearance is recommended from the top of the water heater. A zero clearance is allowed for the sides of the water heater. However, boiler, electrical, and servicing clearances must be figured when locating the water heater.

Minimum Clearance to the Element Cover

See FIG 2-1. Clearances must be a minimum of 24-inches to allow for element removal and replacement on SET model.

3 Boiler Side Piping (SDT models)

Figures 3-1 thru 3-4 show typical boiler side piping for several common situations. Regardless of which system is used it is imperative that the flow rates called for in Table 3C are developed through the coil. This requires properly sized piping and a properly sized pump.

The system shown in FIG's 3-1 thru 3-4 are described below:

Zone with Circulator to Aquastat

This system is like the circulator zone system on a straight heat job except that one of the zones goes to the tank instead of radiation. As on any circulator zone system check valves should be installed in each zone to prevent unwanted circulation through zones which are not calling for heat. Figure 3-1 on page 8 illustrates typical circulator zone piping.

Zone with Valve to Aquastat

As with the circulator zone system, this system is just like a standard heating zone system except that one of the zones is connected to the tank coil as shown in FIG. 3-2 on page 9. The system circulator must be large enough to move boiler water through the coil regardless of the flow rate required through the heating zones.

DHW Prioritization

This piping system is designed to provide direct hot water priority over the other zones in the heating system. When there is a Domestic Hot Water (DHW) call for heat, the Knight control will shut off the boiler circulator and activate the domestic hot water circulator. Once the DHW demand is satisfied, the boiler circulator will be readjusted as demand requires. The circulator must be large enough to move the boiler water through the coil in the tank, and it must meet the minimum boiler flow requirments. The recommended piping for a DHW priority system is depicted in FIG. 3-3 on page 10.

Multiple Tank Connections (Boiler Side)

Multiple tank installations must be done in the "reverse-return" manner. The reason for this is to create the same pressure drop (and therefore, the same flow) through the coil of each tank. The boiler manifold piping must be sized so that each coil has the flow rate called for in Table 3B.

Because the pressure drop through tank coils varies from size to size, it is hard to predict the flow rate that will be developed through each coil when two tanks of different sizes are placed in the same manifold. For this reason it is best not to mix tanks of different sizes in the same zone if their recovery is critical.

3 Boiler Side Piping (SDT models) *(continued)*

Table 3A *Pressure Drop Chart SDT/SET065-080*

Table 3A
Pressure Drop Chart SDT/SET065-080

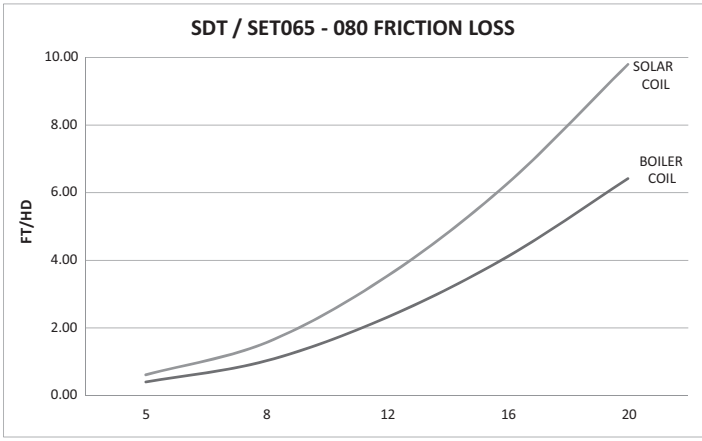


Table 3B *Pressure Drop Chart SDT/SET119*

Table 3B
Pressure Drop Chart SDT/SET119

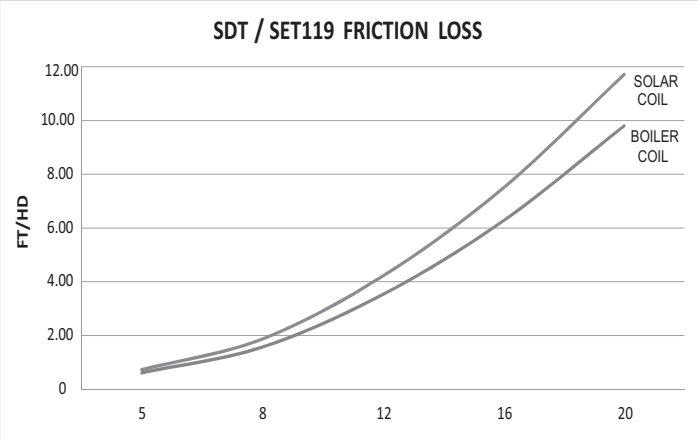


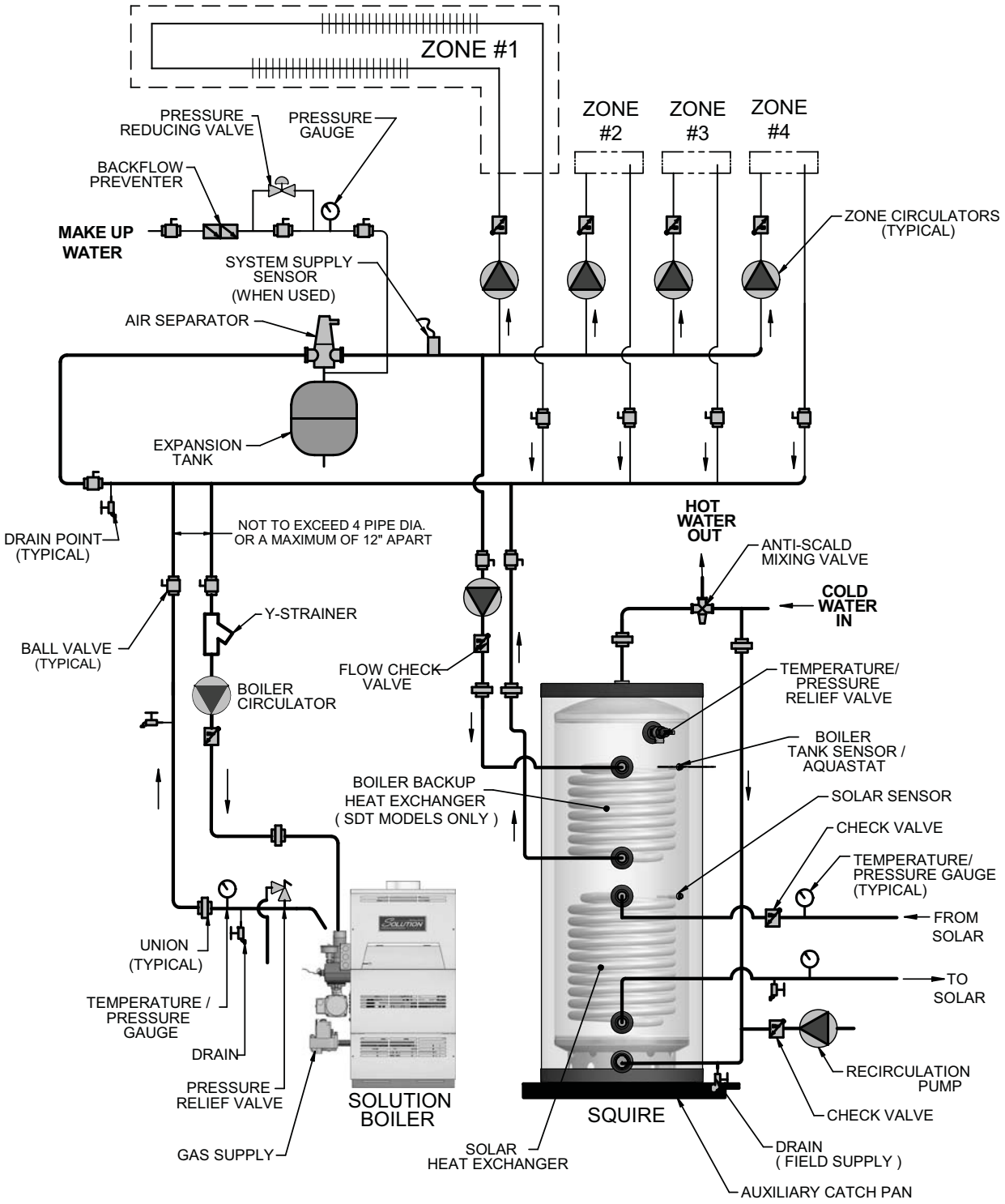
Table 3C *Pressure Drop Values SDT/SET065-119*

Table 3C
Pressure Drop Values

MODEL	COIL CONN. (IN)	COIL LENGTH (FT)	SQ FT SURFACE AREA	PRESSURE DROP SOLAR COIL (FT / HD)					COIL LENGTH (FT)	SQ FT SURFACE AREA	PRESSURE DROP BOILER COIL (FT / HD)				
				5 GPM	8 GPM	12 GPM	16 GPM	20 GPM			5 GPM	8 GPM	12 GPM	16 GPM	20 GPM
SDT065	1	41.5	13.5	0.61	1.57	3.53	6.27	9.8	28	9.2	0.4	1.03	2.31	4.1	6.41
SDT080	1	41.5	13.5	0.61	1.57	3.53	6.27	9.8	28	9.2	0.4	1.03	2.31	4.1	6.41
SDT119	1	67.3	22.0	.73	1.87	4.22	7.5	11.71	48.5	16	0.61	1.57	3.53	6.27	9.8
SET065	1	41.5	13.5	0.61	1.57	3.53	6.27	9.8							
SET080	1	41.5	13.5	0.61	1.57	3.53	6.27	9.8							
SET119	1	67.3	22.0	.73	1.87	4.22	7.5	11.71							

3 Boiler Side Piping (SDT models)

Figure 3-1 *Piping Diagram Zoned with Circulators*

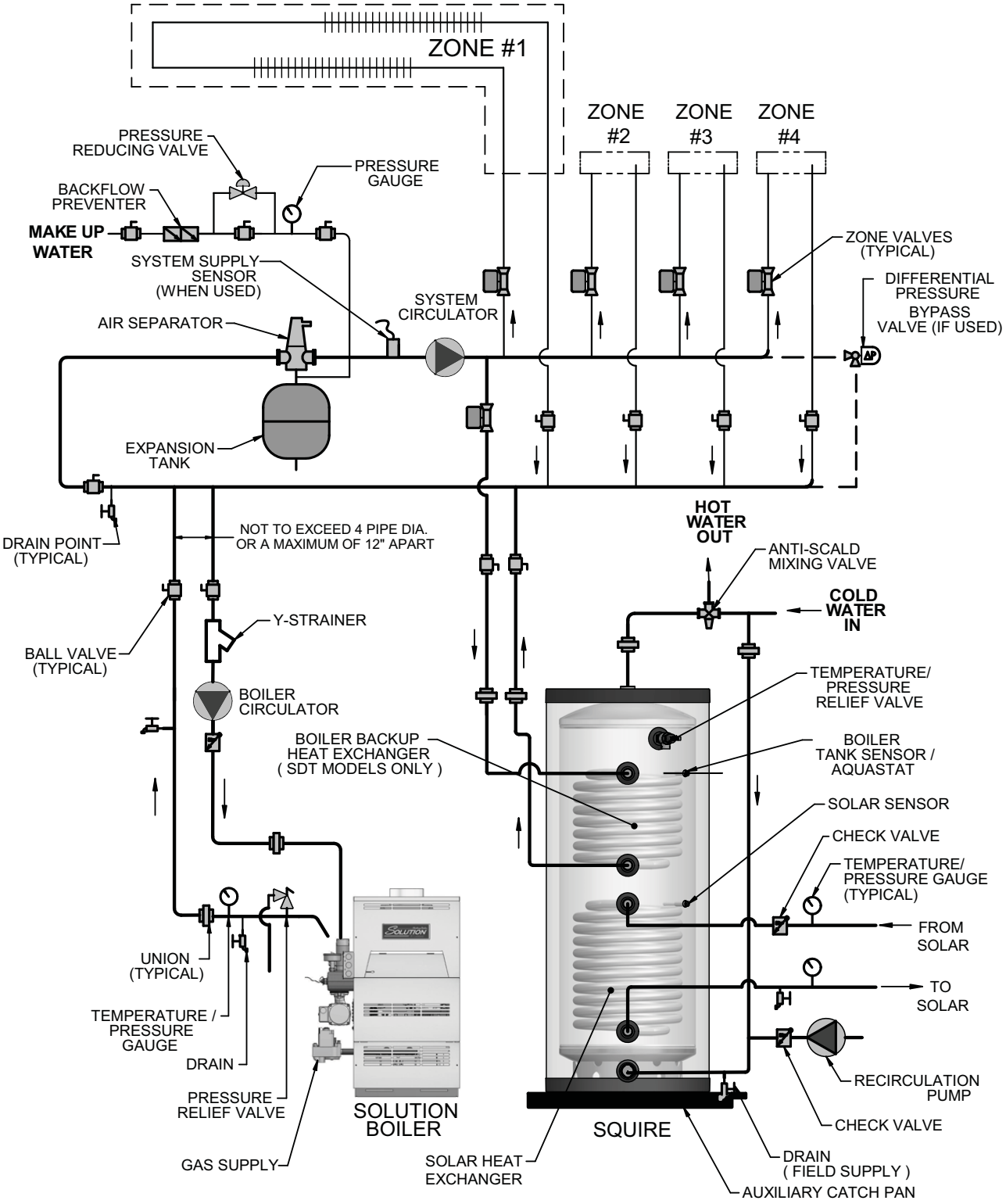


NOTICE Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.

NOTICE Please note that the installer is responsible for ensuring DHW prioritization when piped as a zone.

3 Boiler Side Piping (SDT models) *(continued)*

Figure 3-2 *Piping Diagram Zoned with Valves*

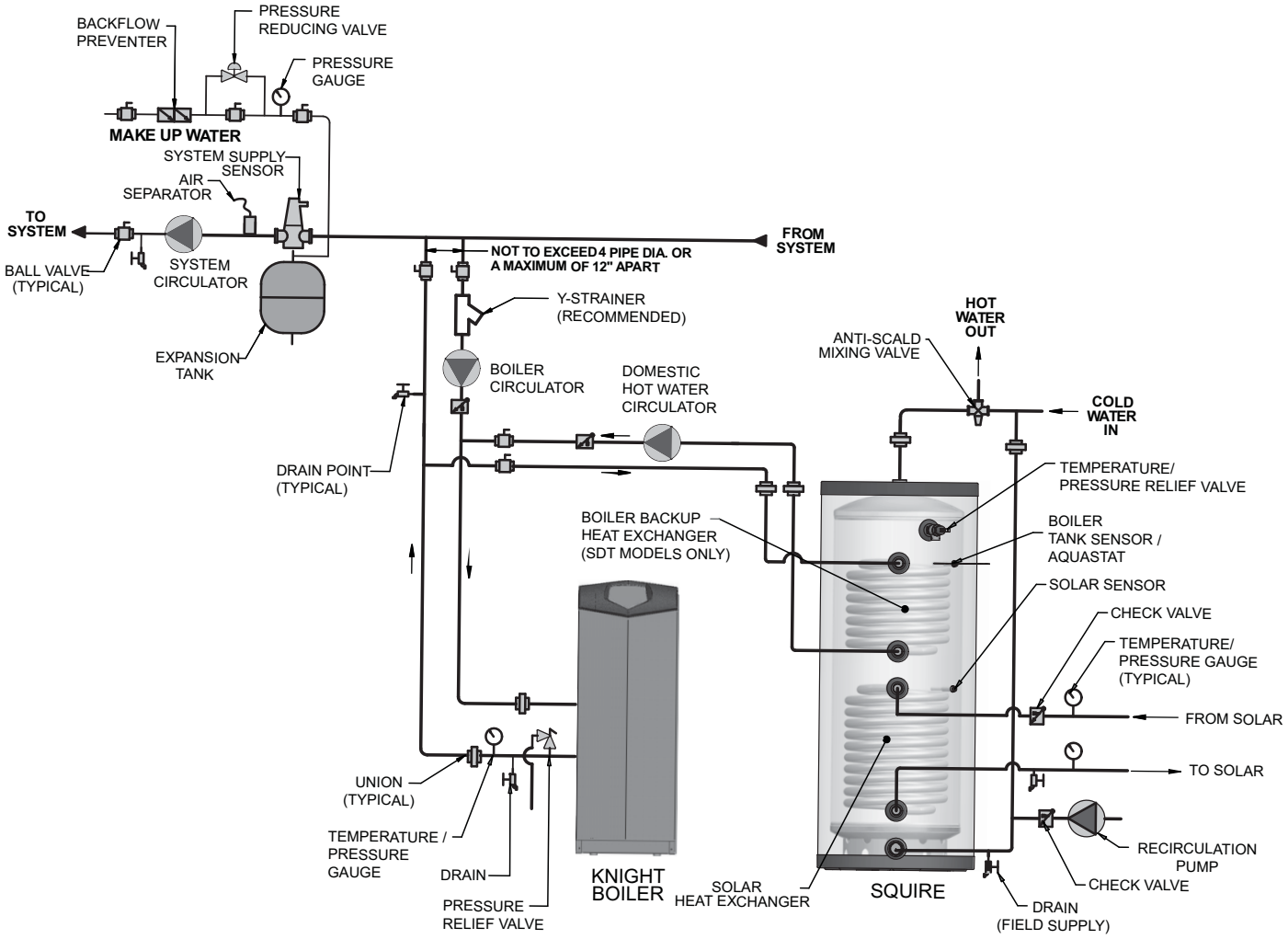


NOTICE Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.

NOTICE Please note that the installer is responsible for ensuring DHW prioritization when piped as a zone.

3 Boiler Side Piping (SDT models)

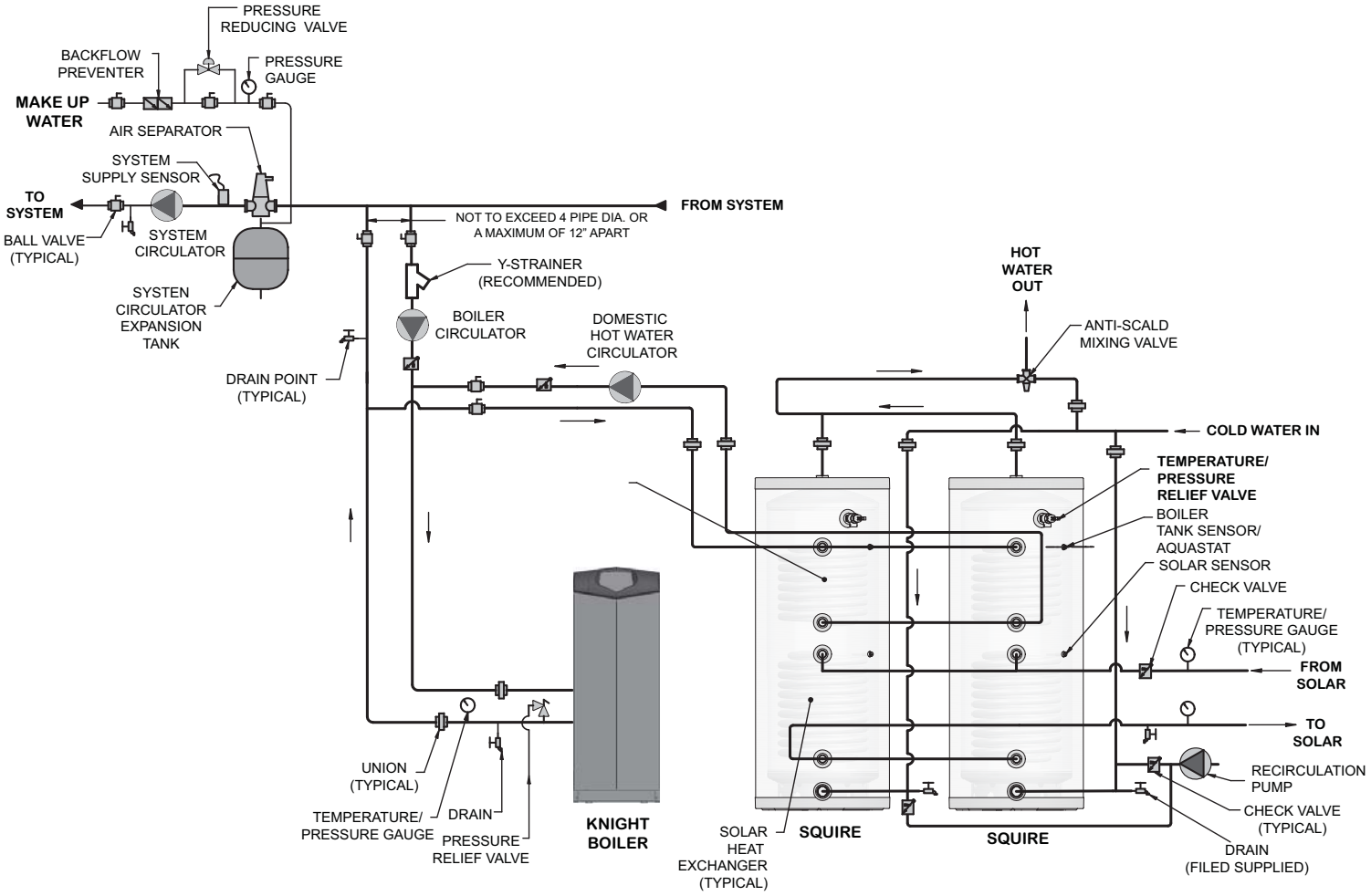
Figure 3-3 *Knight Boiler Primary / Secondary Piping*



NOTICE Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.

3 Boiler Side Piping (SDT models) *(continued)*

Figure 3-4 *Multiple Tank Connections*



NOTICE Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.

4 Domestic Side (Tank) Piping

Basic Domestic Piping

Figure 4-2 on page 15 shows typical domestic water piping for a tank. The function of the components shown are as follows:

a. Shut-off valves (recommended) - Used to isolate the tank for servicing.

b. Backflow Preventer (required by some codes) - Used to prevent water from backing out of the tank and into the main potable water supply in the event that inlet water pressure drops.

c. Expansion Tank (required for thermal expansion)- his expansion tank absorbs the increased volume caused by heating water.

Use an expansion tank designed for use on domestic water systems. Refer to the expansion tank manufacturer's literature for the proper size expansion tank to use.

NOTICE When an expansion tank is used, do not put any valves between the expansion tank and tank inlet.

d. Unions (recommended) - Used to disconnect the tank in the unlikely event that this is necessary.

e. Drain (required) - Used to drain the tank for inspection or servicing.

Multiple Tank Domestic Water Piping

The two pipe reverse return piping uses more pipe than the two pipe direct return piping, but the flow is more balanced and even in the two pipe reverse return piping layout (see FIG. 3-4).

Each tank must have its own T&P valve. It is recommended that each tank be equipped with its own isolation valves, unions, and drains so that one tank may be removed from the system. If local codes require a backflow preventer, check with the appropriate authority to find out whether one backflow preventer may be used for tanks or each tank must be equipped with its own backflow preventer. If each tank must have its own backflow preventer, each tank must also have its own expansion tank. If a common backflow preventer is permitted, an expansion tank must be sized to accommodate the expansion volume of all tanks.

Domestic Water Piping for Distant Fixtures

In some cases the furthest fixture may be quite distant from the tank. Such an installation would result in an unacceptable delay before hot water reaches these distant fixtures. Even if all the fixtures are relatively close to the tank, the building owner may want hot water at all fixtures as soon as they are opened.

To prevent delays, return circulation piping with a check valve that allows flow to the inlet of the tank. This should be installed on each branch circuit at the farthest fixture or device, so that hot water is supplied upon demand.

Because hot water is always circulating in the hot water branch, the entire branch should be insulated to prevent excessive heat loss.

4 Domestic Side (Tank) Piping *(continued)*

Anti-scald Valves (Mixing Valves)

Anti-scald valves used with water heaters are also called tempering valves or mixing valves. An anti-scald valve mixes cold water in with the outgoing hot water to assure that hot water reaching a building fixture is at a temperature low enough to be safe. ASSE1017 and ASSE1070 certified valves are recommended.

Usually, the maximum temperature of the outlet water will stay near the setting of the tank control. In some cases, however, hot water usage patterns can cause the outlet water temperature to rise significantly above the control setting.

The temperature of water going to the fixtures may be more carefully controlled through the use of a thermostatic mixing valve. This device blends a controlled amount of cold water with the hot water leaving the tank so that water at a more constant temperature exits the mixing valve. Anti-scald mixing valve piping is illustrated in FIG.'s 3-1 thru 3-4.

⚠ WARNING An anti-scald mixing valve does not eliminate the risk of scalding.

* Set the tank thermostat as low as practical.
* Feel water before bathing or showering.
* If anti-scald or anti-chill protection is required, use devices specifically designed for such service. Install these devices in accordance with their manufacturer's instructions.

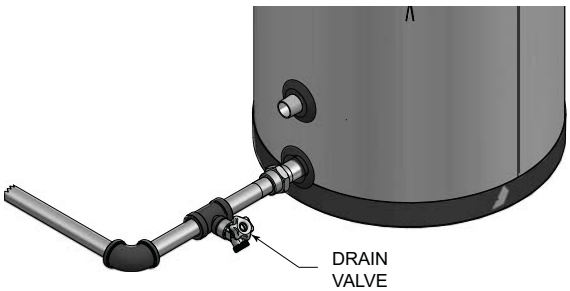
Install Drain Valve

Drain valve and fittings are supplied by others.

Standard Installation

- Install a tee connection at the domestic cold water inlet (FIG. 4-1).

Figure 4-1 *Drain Valve Installed*



Temperature & Pressure (T&P) Relief Valve

⚠ WARNING For protection against excessive temperatures and pressure, install temperature and pressure protective equipment required by local codes, but not less than a combination temperature and pressure relief valve certified by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials as meeting the requirements for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems, ANSI Z21.22 and the Standard CAN1-4.4, Temperature, Pressure, Temperature and Pressure Relief Valves and Vacuum Relief Valves. The combination temperature and pressure relief valve shall be marked with a maximum set pressure not to exceed the maximum working pressure of the water heater. The combination temperature and pressure relief valve shall also have an hourly rated temperature steam BTU discharge capacity not less than shown in Table 4A, page 14.

Install the combination temperature and pressure relief valve into the opening provided and marked for this purpose on the water heater.

4 Domestic Side (Tank) Piping

NOTICE Verify that the combination temperature and pressure relief valve complies with local codes. If the combination temperature and pressure relief valve does not comply with local codes, replace it with one that does. Follow the installation instructions in this section.

Do not place a valve between the combination temperature and pressure relief valve and the tank.

Determine T&P relief valve size by the following specifications, unless they conflict with local codes:

- SDT/SET065/080/119 - 3/4" NPT with a minimum CSA Rating of 200,000 Btu/hr.

NOTICE The Lochinvar SDT/SET series water heaters will absorb/store less than 200,000 Btu/hr when domestic water outlet temperature is 210°F and boiler water supply temperature is 240°F. Listed outputs are based on ASME Section VIII Interpretation VIII-1-86-136. Check with local codes for applicability.

Table 4A
Minimum Relief Valve (CSA Rating)

Model	BTU/hr
SDT/SET065	200,000
SDT/SET080	200,000
SDT/SET119	200,000

Standard Installation

- Install the T&P relief valve in the connection marked "Relief Valve".

T&P Relief Valve Discharge Piping

T&P relief valve discharge piping **must** be:
- made of material serviceable for a temperature of 250°F or greater.
- directed so that hot water flows away from all persons.
- directed to a suitable place for disposal.
- installed so as to allow complete draining of the T&P relief valve and discharge line.
- terminated within 6" of the floor.

T&P relief valve discharge piping **must not** be:
- excessively long. Using more than two (2) elbows or 15 feet of piping can reduce discharge capacity.
- directly connected to a drain. Refer to local codes.
- subject to freezing.

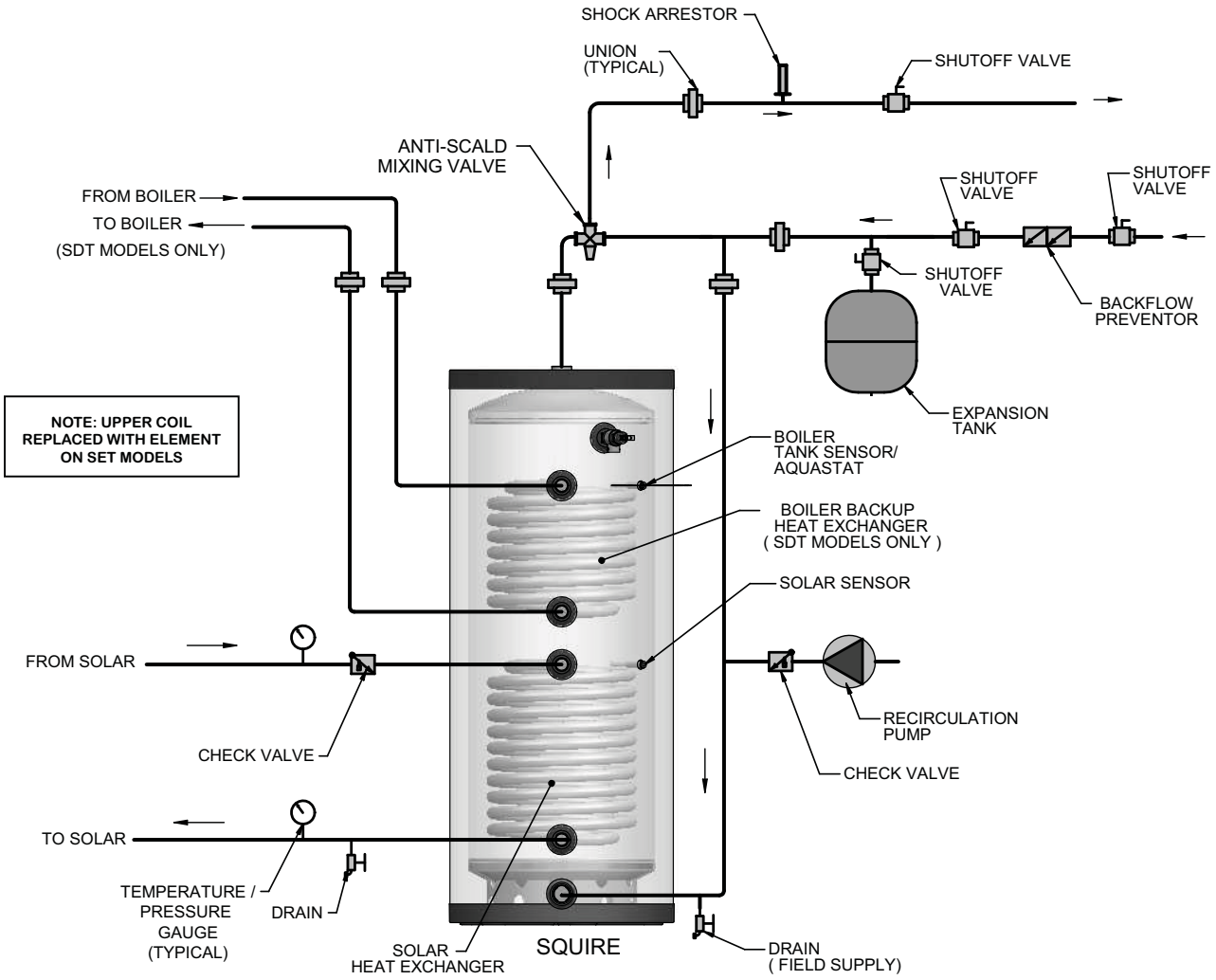
⚠ WARNING Do not install any valve between the T&P relief valve and the tank connection or on the T&P relief valve discharge piping. Improper placement and piping of T&P relief valve can cause severe personal injury, death or substantial property damage.

⚠ CAUTION The T&P relief valve is not intended for constant duty, such as relief of pressure due to repeated normal system expansion. Correct this condition by installing a properly sized expansion tank in a domestic water system. Refer to the expansion tank manufacturer's installation instructions for proper sizing.

⚠ WARNING Failure to install and maintain a new, listed 3/4" X 3/4" temperature and pressure relief valve will release the manufacturer from any claim which might result from excessive temperature and pressures.

4 Domestic Side (Tank) Piping *(continued)*

Figure 4-2 *Recommended Domestic Water Piping SDT/SET models*



NOTICE Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.

5 Wiring

Electrical Connection

(Squire solar water heater with electric back up only -- SET models only)

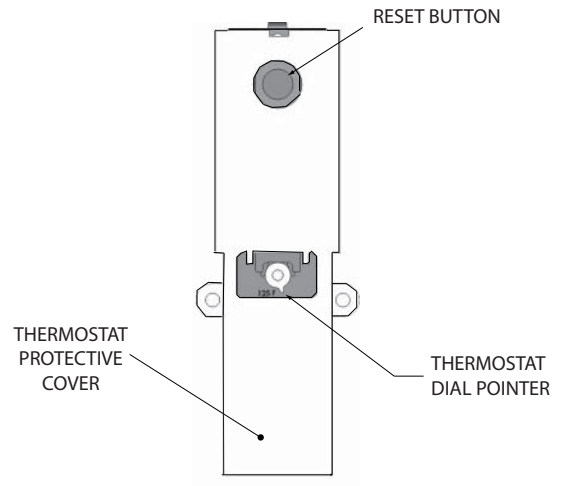
⚠ WARNING Tank must be full before unit is turned on! The heating element will be damaged if energized for even a short period of time while tank is dry!

⚠ CAUTION Be sure to ground the water heater. The preferred way to ground is to use rigid metal conduit between the main panel and the water heater junction box with approved end fittings. The separate ground wire connection provided in the water heater junction box must also be grounded. Replace the junction box cover and insulation after you have made all wiring connections.

The 4500-watt heating element in the Squire SET is wired to the junction box on top of the heater and it requires 240-volt/ A.C. electrical service. The voltage requirement and wattage load for the heater is also specified on the heater identification plate. A 1/2" E.M.T. opening, located on top of the unit is provided for a field wiring connection. Consult an electrician to determine if your electrical service is adequate for the additional load of the heater. The electrical installation should be done by a qualified licensed electrician. All wiring must conform to the National Electric Code and local codes.

⚠ CAUTION The manufacturer's warranty does not cover any damage or defect caused by the installation, attachment or use of any type of unapproved devices into, onto or in conjunction with this water heater. The use of unauthorized energy saving devices may shorten the life of the water heater and may endanger life and property. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized devices.

Figure 5-1 *Thermostat*



After the water and electrical connection have been made and the tank has been filled with water, turn on the power to heater. The heater is now operational.

Thermostat Adjustment

The thermostat is located in the front of the heater. The access cover must be removed to adjust to the factory default setting of 120°F. This temperature is satisfactory for the average household use.

1. Turn off power to the heater.
2. Remove access cover and insulation. Do not remove the thermostat protective cover.
3. Set temperature indicator to desired temperature, then replace insulation and access cover.
4. Turn on power to heater.

Combination "Thermostat and High Limit Control (ECO)"

This heater is equipped with a combination thermostat and high limit safety. If for any reason the water temperature becomes eccessively high, the "High Limit Control (ECO" breaks the circuit to the heating element. Once the switch opens, it must be reset manually.

NOTICE The cause of the over temperature condition must be corrected first.

. To reset, press the red button as shown in FIG. 5-1. Replace the insulation and access cover before turning on power to the heater.

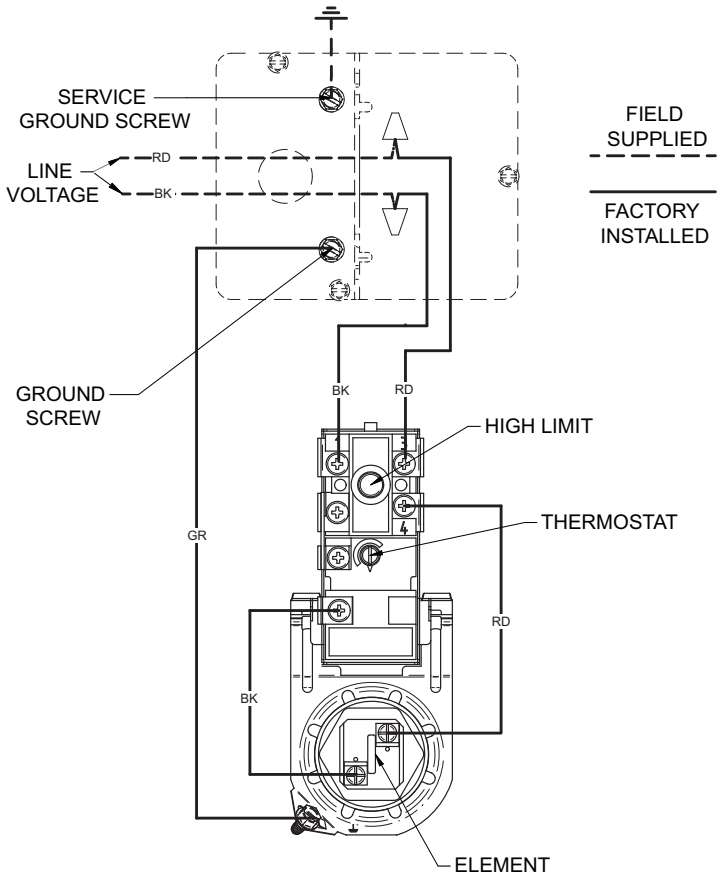
5 Wiring *(continued)*

Table 5A *Wiring SET065-SET119*

SET Wiring (Single Element)				
Model	**Volts / Phase**	**Watts / AMPS**	**Breaker Type**	***Wire Gage**
SET065	240 VAC / 1 Ph	4500 / 18.3	25 AMP / DPDT	12 ga. THHW
SET080	240 VAC / 1 Ph	4500 / 18.3	25 AMP / DPDT	12 ga. THHW
SET119	240 VAC / 1 Ph	4500 / 18.3	25 AMP / DPDT	12 ga. THHW

***** Rated for 90°C

Figure 5-2 *Combination Thermostat and High Limit Control, SET 065-SET119*



5 Wiring

Indirect Water Heater Sensor Setup (Knight Boiler)

⚠ CAUTION Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

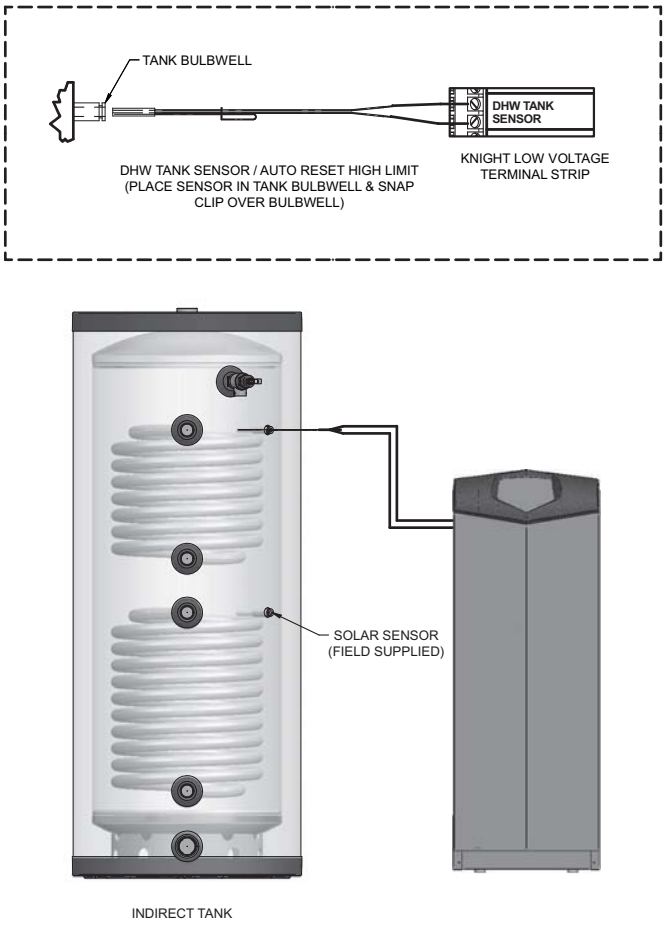
NOTICE The sensor supplied contains an Auto Reset High Limit (194°F).

Install Tank Sensor

The tank sensor is a dual sensor which controls the temperature of the tank from the boiler(see FIG. 5-3). The tank sensor has a built-in high temperature limit set at 194°F.

1. Install the sensor inside the tank as depicted in FIG. 5-3.
2. Connect the wire leads to the DHW Tank Sensor (AUX) connection point on the Knight boiler connection board (see FIG. 5-3).
3. The Knight boiler will automatically read the sensor and default the tank temperature setting to 125°F.
4. Adjust the tank set point program. Reference the Knight Installation and Operation Manual for a detailed explanation of the tank set point program.

Figure 5-3 *Indirect Water Heater Controlled Using Tank Sensor*

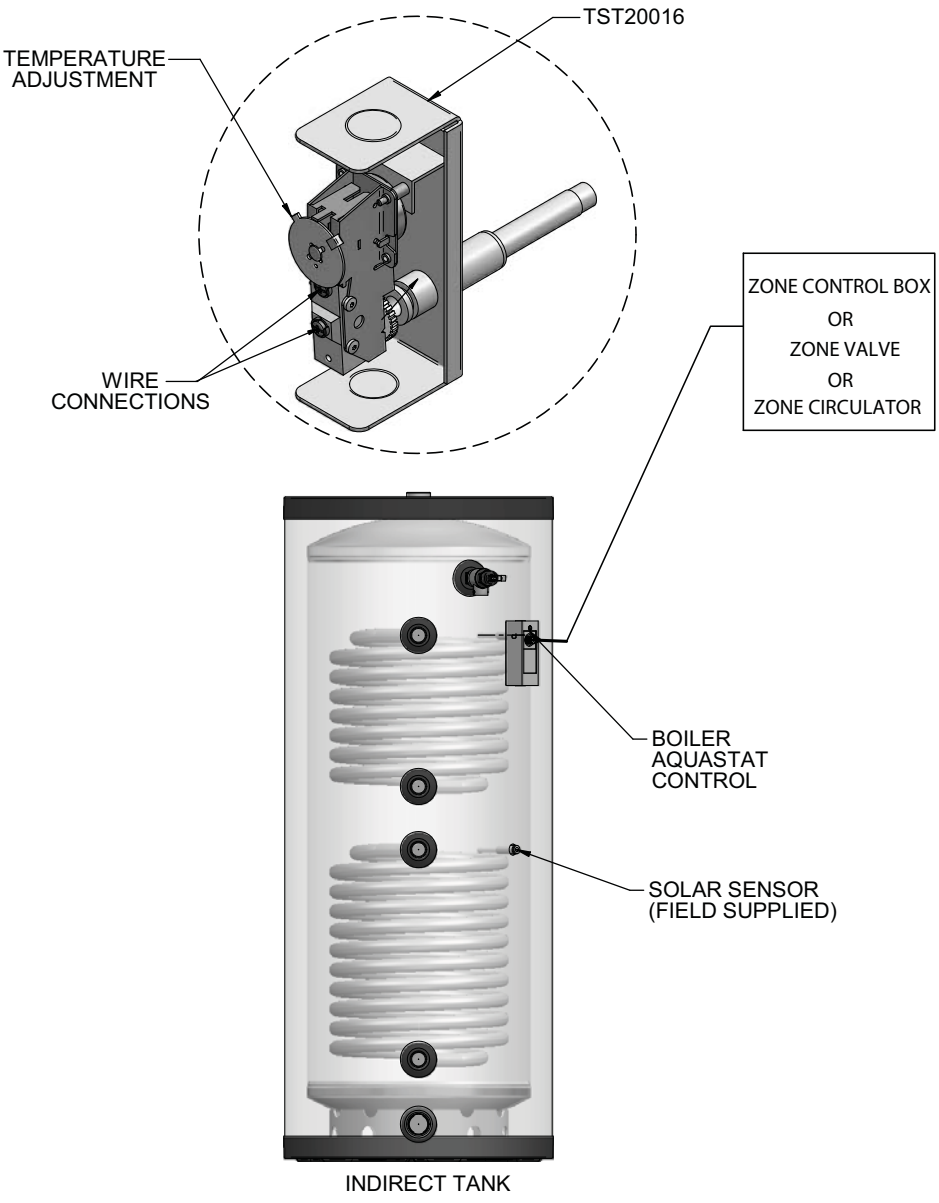

TANK BULBWELL
DHW TANK SENSOR
KNIGHT LOW VOLTAGE TERMINAL STRIP
DHW TANK SENSOR / AUTO RESET HIGH LIMIT (PLACE SENSOR IN TANK BULBWELL & SNAP CLIP OVER BULBWELL)
SOLAR SENSOR (FIELD SUPPLIED)
INDIRECT TANK

5 Wiring *(continued)*

Indirect Water Heater Controlled Using Aquastat and Zone Circulator / Valve

1. Install Aquastat to tank. Aquastat control (TST20016) can be ordered from your local Lochinvar distributor.
2. Connect Aquastat to the zone controller for the Indirect Water Heater Zone.
3. Adjust Aquastat to the desired temperature.

Figure 5-4 *Wiring for Zone Control*



6 Start-up and Check-out

1. Make sure the system is free of leaks and that air is purged from the system.

CAUTION Fix any leaks found before proceeding further. Leakage from the boiler piping can result in severe damage to the boiler.

2. Many soldering fluxes contain Zinc Chloride which can cause severe corrosion damage to stainless steel. After completing all domestic water connections, flush the indirect water heater thoroughly before leaving the installation. This is particularly important if the indirect water heater will be unused for an extended period of time after installation. Flush the indirect water heater by drawing at least three times its volume from the tank.

3. Make sure that all electrical connections are made correctly and that no exposed high voltage wiring is present.

4. Make sure that each zone valve or circulator operates when, and only when, its thermostat calls for heat. Let each zone operate long enough to purge any remaining air from the system.

5. Set the indirect water heater to the desired temperature. Because hot water presents a scald hazard, it is best to set the thermostat at 120°F or lower and raise it only if necessary to provide adequate hot water.

6. Re-enable the burner and allow the boiler to operate. Make sure that the boiler shuts down when the indirect water heater is satisfied.

7 Maintenance

The Lochinvar SDT/SET series indirect water heater is an extremely simple device and as such requires very little maintenance. There are, however, several items which should be checked out on an annual or as needed basis to ensure a reliable supply of hot water:

* Make sure that the rest of the solar, boiler and domestic water piping is free of leaks.
* If there is an oil lubricated circulator in the system, make sure it is lubricated as called for by the circulator manufacturer.
* Make sure that the boiler is maintained in accordance with the boiler manufacturer's instructions.
* If a water treatment system is required to keep the water chemistry within the parameters shown in Table 2A (see Section 2 - Pre-Installation), make sure that this system is properly maintained.

Maintenance Schedule

Annual service by a qualified service technician should include the following:

- ❑ Any procedure required by local codes.
- ❑ Verify system pressure. Air venting procedure may require adding water to bring boiler system up to pressure, typically 12 psig.
- ❑ Manually operate T&P relief valve at least once a year. This will release some hot water.

⚠ WARNING Before operating a T&P relief valve, make sure no one is in front of or around the T&P relief valve discharge piping. Hot discharge water can cause severe personal injury or substantial property damage.

- ❑ Move operating lever to open position for a few seconds and then move it back, allowing it to snap closed. After the T&P relief valve is operated, if it continues to release water, close the cold water inlet to the water heater immediately. Follow the draining instructions, and replace the T&P relief valve. If the T&P relief valve weeps periodically, it may be due to thermal expansion. Do not plug the T&P relief valve or discharge piping.

⚠ DANGER Plugging the T&P relief valve or discharge piping can cause excessive pressure in the water heater, resulting in severe personal injury, death, or substantial property damage.

- ❑ Follow instructions on circulator to oil, if required.
- ❑ Check mixing valve, valves, pipes, and fittings for leaks.
- ❑ Check function of the field-installed controls and valves. See component manufacturer's instructions.
- ❑ Review homeowner's maintenance responsibilities and their frequencies, including any not listed in the following section.

Homeowner monthly maintenance to include:

- ❑ Visually check valves, pipes, and fittings for leaks. Call a qualified service technician to repair leaks.

To Fill the Water Heater

1. Close the water heater drain valve by turning the knob clockwise.
2. Open the cold water supply shutoff valve.
3. Open several hot water faucets to allow air to escape from the system.
4. When a steady stream of water flows from the faucets, the water heater is filled. Close the faucets and check for water leaks at the water heater drain valve, combination temperature and pressure relief valve and the hot and cold water connections.

⚠ WARNING Water from opened drain valves, unions and other connections may be extremely hot. To avoid severe personal injury, death, or substantial property damage:

- Tighten all drain hose connections.
- Direct hot water away from all persons.

To Drain the Water Heater

Should it become necessary to completely drain the water heater, be sure to follow the steps below:

1. Disconnect the power supply to the heat source. Consult the plumbing professional or electric company in your area for service.
2. Close the cold water supply shutoff valve.
3. Open the drain valve on the water heater.
4. Open a hot water faucet to allow air to enter the system.

Drain the water heater if it will be shut off and exposed to freezing temperatures. Freezing water will expand and damage the water heater.

- If boiler water contains sufficient antifreeze, then only the domestic water needs to be drained.
- If boiler water does not contain sufficient antifreeze, the boiler water and the domestic water must be drained.

If antifreeze is used in the boiler water, check concentration. Boiler water (including additives) must be practically non-toxic, having a toxicity rating or class of 1, as listed in the "Clinical Toxicology of Commercial Products". A maximum 50/50 mixture of inhibited propylene glycol is recommended. Follow the antifreeze manufacturer's instructions.

⚠ WARNING Do not use automotive, ethylene glycol or petroleum-based antifreeze. Do not use any undiluted antifreeze. This can cause severe personal injury, death, or substantial property damage.

8 Performance Data

Table 8A *SET Backup Recovery Performance*

Model	Heat Exchanger Volume Gallons	Heated Water Volume Gallons	Recovery Back Up Minutes		* First Draw Gallons	
	Solar		65°F Rise	90°F Rise	115°F	140°F
SET065	2.2	28	78	108	34	26
SET080	2.2	35	89	123	44	31
SET119	3.2	44	120	166	55	42

Table 8B *SDT Backup Recovery Performance*

Model	Heat Exchanger Volume Gallons		Heated Water Volume Gallons	Recovery Back Up Minutes		Boiler Output for Recovery BTU/HR	* First Draw Gallons	
	Boiler	Solar		65°F Rise	90°F Rise		115°F	140°F
SDT065	1.9	2.2	32	8	13	128,000	42	30
SDT080	1.9	2.2	36	9	15	128,000	49	35
SDT119	2.6	3.2	53	10	17	217,000	65	50

*Amount of water drawn from tank with no energy input

How to Properly Size Your Indirect Water Heater

Use the First Hour Rating (FHR) to properly size your Indirect Water Heater. The FHR is the amount of hot water in gallons the water heater can supply in the first hour of operation (starting with a tank full of hot water). The FHR is dependent on tank capacity, source of heat, and the size of the burner.

The Indirect Water Heater and Boiler sizing charts can be found on pages 23 and 24. Locate your Indirect Water Heater and Boiler along with your required First Hour Rating. This will also determine the flow needed between the Indirect Water Heater and Boiler.

NOTICE The charts utilize only the upper boiler coil and the upper half of the tank.

8 Performance Data *(continued)*

Table 8C *First Hour Rating - 180°F Boiler Loop Water (Knight and Wall Mount Boilers, Upper Coil SDT Models)*

First Hour Rating - 180°F Boiler Loop Water (Knight Boiler - SDT065 - SDT119)

	Model		SDT065										SDT080										SDT119									
	Boiler Supply Water		180										180										180									
	Circulator Flow GPM		5		8		12		16		20		5		8		12		16		20		5		8		12		16		20	
	Domestic Outlet		115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140
WB050	Boiler Heating Capacity	45,000	117	92	117	92							122	97	122	97							138	113	138	113						
K/WB081		72,000	169	129	169	129							174	134	174	134							191	150	191	150						
K/WB106		94,000	205	154	211	159							210	159	216	164							234	181	234	181						
K/WB151		135,000			235	176	255	190							240	181	260	195							314	238	314	237				
K/WB211		190,000					255	190	281	208							260	195	286	213							385	288	413	308		
KB286		260,000					255	190	281	208	301	222					260	195	286	213	306	227					385	288	413	308	475	351
KB400		373,000									301	222									306	227									475	351
KB501		467,000									301	222									306	227									475	351
	MAX BTU INPUT		90256		106525		116697		130105		139966		90257		106525		116698		130105		139967		123218		148780		171607		185675		217372	

Note: Testing conducted with 50°F inlet cold water

Table 8D *First Hour Rating - 180°F Boiler Loop Water (Universal Sizing. Upper Coil SDT Models)*

First Hour Rating - 180°F Boiler Loop Water (Universal Sizing - 45,000 - 295,000 Btu/hr / SDT065-SDT119)

Model		SDT065										SDT080										SDT119									
Boiler Supply Water		180										180										180									
Circulator Flow GPM		5		8		12		16		20		5		8		12		16		20		5		8		12		16		20	
Domestic Outlet		115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140
Boiler Heating Capacity	45,000	117	92	117	91							122	97	122	97							138	113	138	113						
	60,000	146	112	146	112							151	117	151	117							168	134	168	134						
	75,000	174	133	174	133							180	138	180	138							197	154	197	154						
	95,000	205	154	213	160	213	160					210	159	218	165	218	165					236	182	236	182	236	182				
	115,000	205	154	235	175	254	189	254	189			210	159	240	180	254	190	254	190			275	210	275	210	275	210	275	210		
	140,000	205	154	235	175	260	193	286	211	295	218	210	159	240	180	260	195	286	213	306	227	292	222	324	244	324	244	324	244	324	244
	165,000	205	154	235	175	260	193	286	211	295	218	210	159	240	180	260	195	286	213	306	227	292	222	341	257	373	279	373	279	373	279
	195,000			235	175	260	193	286	211	295	218			240	180	260	195	286	213	306	227			341	257	385	288	413	308	431	320
	225,000					260	193	286	211	295	218					260	195	286	213	306	227					385	288	413	308	475	351
	260,000									295	218									306	227									475	351
	295,000																													475	351
MAX BTU INPUT		90256		106525		118352		131827		139966		90257		106525		118352		131827		139967		123218		148780		171607		185675		217372	

Note: Testing conducted with 50°F inlet cold water

8 Performance Data

Table 8E *First Hour Rating 200°F Boiler Loop Water (Universal Sizing, Upper Coil SDT Models)*

First Hour Rating - 200°F Boiler Loop Water (Universal Sizing - 45,000 - 295,000 Btu/hr / SDT065-119)																																
Model		SDT065										SDT080										SDT119									
Boiler Supply Water		200										200										200									
Circulator Flow GPM		5		8		12		16		20		5		8		12		16		20		5		8		12		16		20	
Domestic Outlet		115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140	115	140
Boiler Heating Capacity	45,000	117	94	117	94							122	99	122	99							135	113	135	113						
	60,000	146	115	146	115							151	120	151	120							164	133	164	133						
	75,000	175	137	175	137							180	142	180	142							192	154	192	154						
	95,000	214	165	214	165	214	165					206	160	206	160	206	160					230	182	230	182	230	182				
	115,000	252	193	252	193	252	193	252	193			270	208	243	187	243	187					268	210	268	210	268	210				
	140,000	265	203	283	216	283	216	283	216	283	216	270	208	286	220	286	220	286	220			315	245	315	245	315	245	315	245		
	165,000	265	203	305	232	328	249	328	249	328	249	270	208	310	237	333	254	333	254	333	254	357	276	362	279	362	279	362	279	362	279
	195,000	265	203	305	232	334	253	349	265	369	279	270	208	310	237	339	258	367	279	374	284	357	276	419	321	419	321	419	321	419	321
	225,000			305	232	334	253	349	265	369	279			310	237	339	258	367	279	374	284			432	331	475	362	475	362	475	362
	260,000							349	265	369	279					339	258	367	279	374	284					487	372	530	403	542	412
	295,000																			374	284							530	403	602	456
MAX BTU INPUT		121786		153207		168199		176783		188081		121786		153207		168199		176783		188081		162144		202222		231672		253492		291792	

Note: Testing conducted with 50°F inlet cold water

9 High Output Piping

High Domestic Hot Water Usage

When a large amount of hot water is required by a Domestic Hot Water system, the dual coil indirect water heater can be piped together when given the high volume needed to satisfy the high load demands. This is achieved by piping the boiler coil and solar coil together. This will enable heat transfer to both the heat exchangers at the same time. This is done by series piping or piping in parallel. A decision must be made to choose a particular system based on the heating coil pressure drop and the desired flows. This type of piping can be done in a solar operation as well as with a boiler to acheive this maximum heat transfer into the water.

Series Piping

With this style of installation, the solar / boiler supply piping is connected to boiler water IN connection. When joining in this operation, all fittings must be no smaller than one-inch in size. Then, the boiler water OUT and the solar water IN are connected. This will join the boiler and soiler coils together. The return water is piped from the solar return to the solar / boiler supply. See FIG. 9-1 on page 26.

NOTICE For tank operation use the lower bulbwell to turn the tank on and off.

Parallel Piping

With this style of installation, both heat exchanger are used at the same time. Solar / boiler supply piping to the solar water IN and boiler coils will be at the same temperature at the same time. Then, the boiler return and the solar return are piped together again to return the water to the heat source. See FIG 9-2 on page 27.

NOTICE For tank operation use the lower bulbwell to turn the tank on and off.

The two-pipe reverse return hydronic loop is more balanced and even than the two-pipe direct return hydronic loop. Both heat exchangers receive the same temperature of water so it is the same as the two-pipe return, but with more advantages. One advantage over the two-pipe system is a balanced flow of the reverse return system. This system can have a lower pressure drop for both heat exchangers than the two-pipe system, and it also requires less energy.

9 High Output Piping

Figure 9-1 *Indirect Boiler with Series Piping*

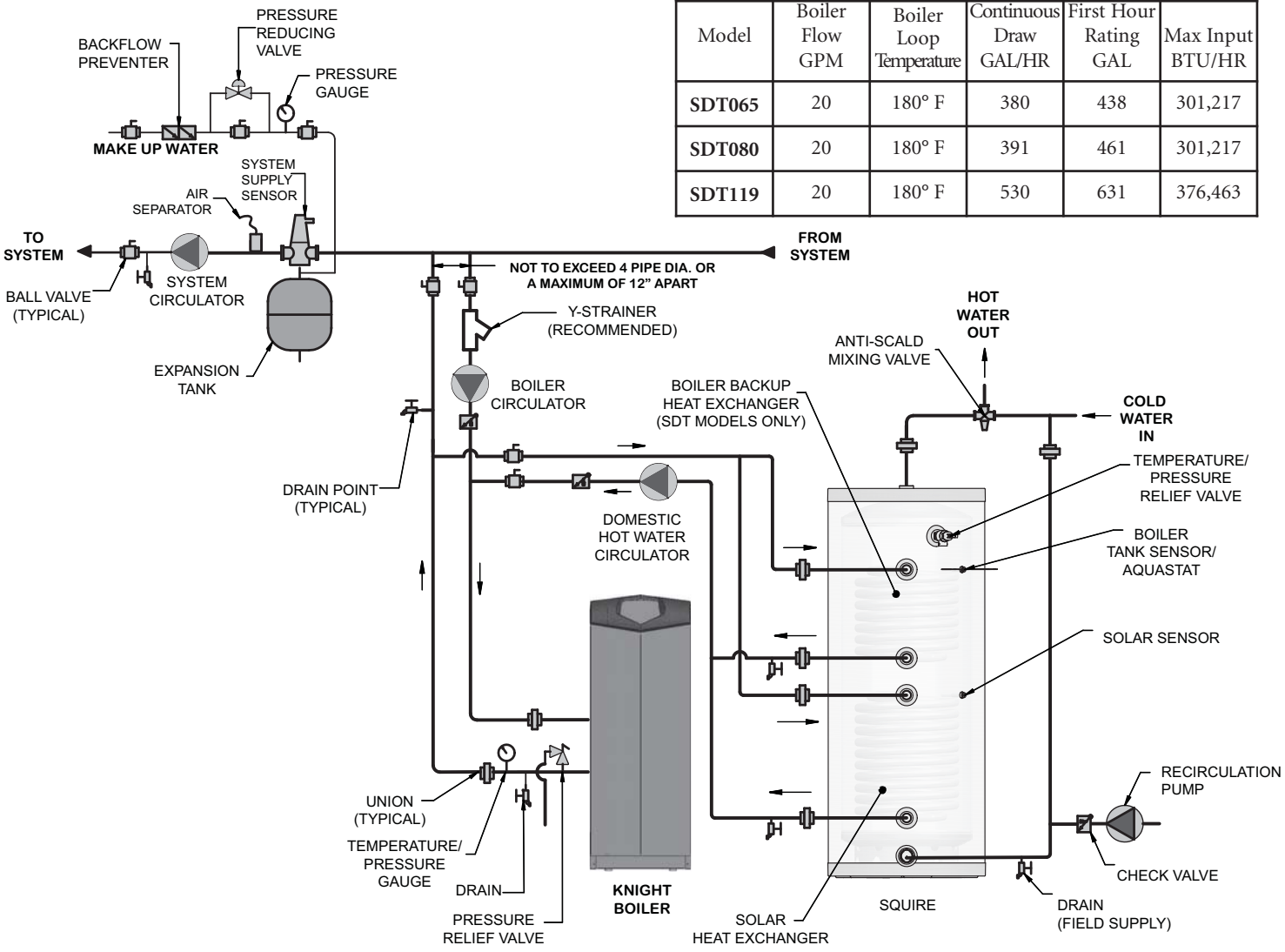
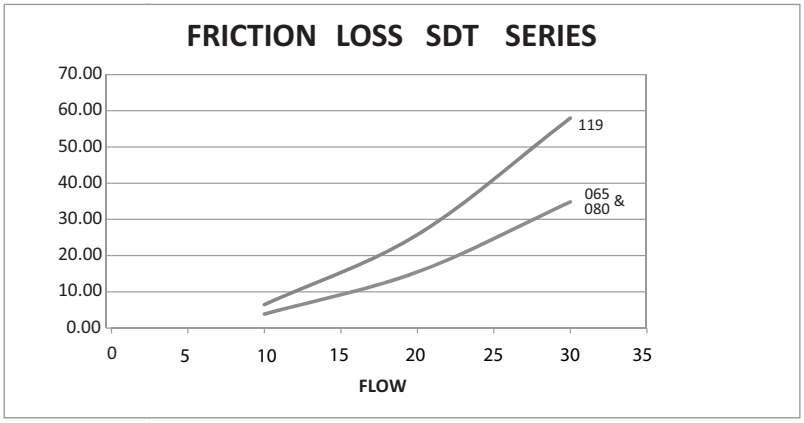


Table 9A
Series Configuration

Model	Boiler Flow GPM	Boiler Loop Temperature	Continuous Draw GAL/HR	First Hour Rating GAL	Max Input BTU/HR
SDT065	20	180° F	380	438	301,217
SDT080	20	180° F	391	461	301,217
SDT119	20	180° F	530	631	376,463

NOTICE Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.

Table 9B *SDT Series Friction Loss*

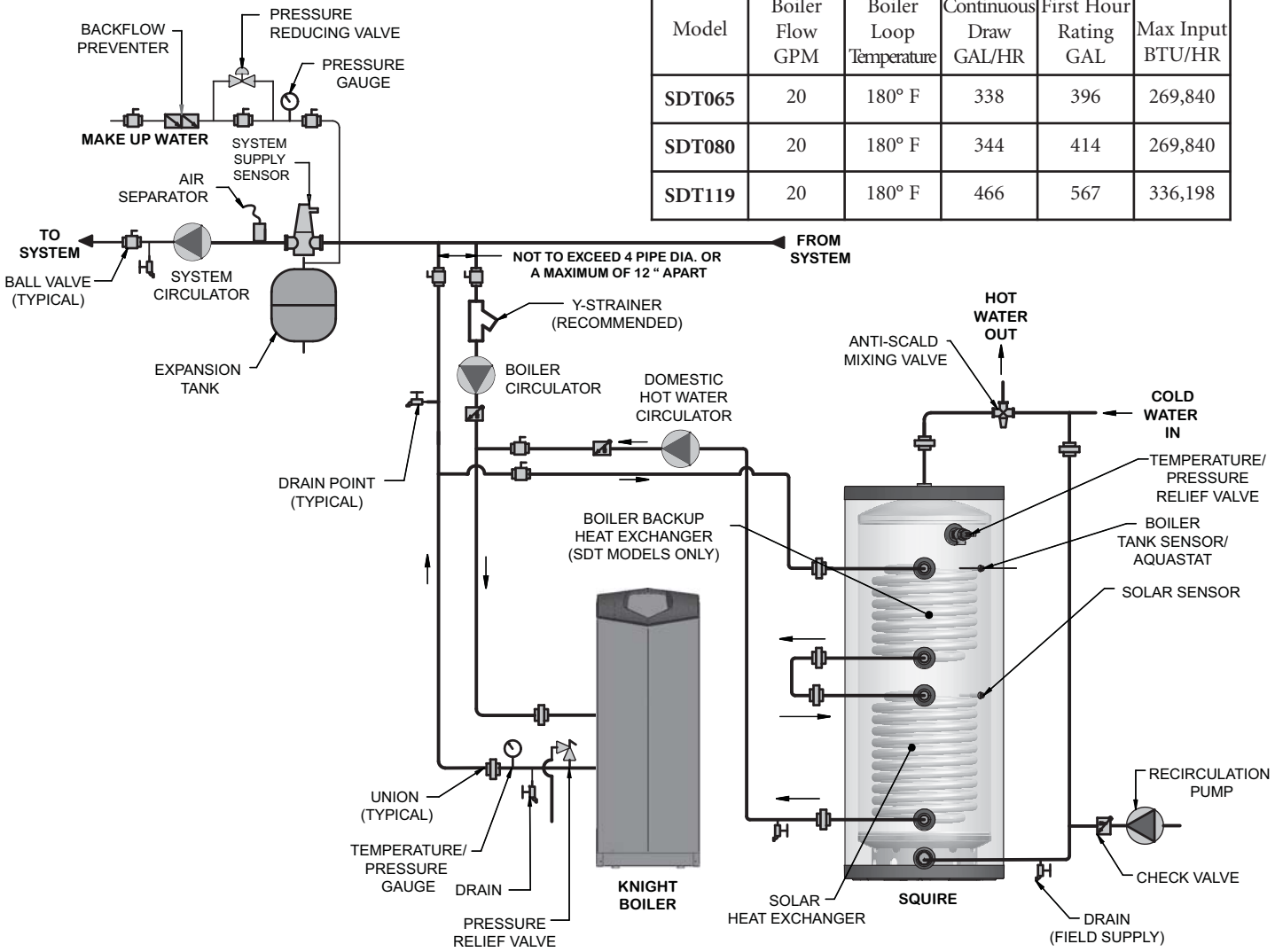


9 High Output Piping *(continued)*

Figure 9-2 *Indirect Boiler with Parallel Piping*

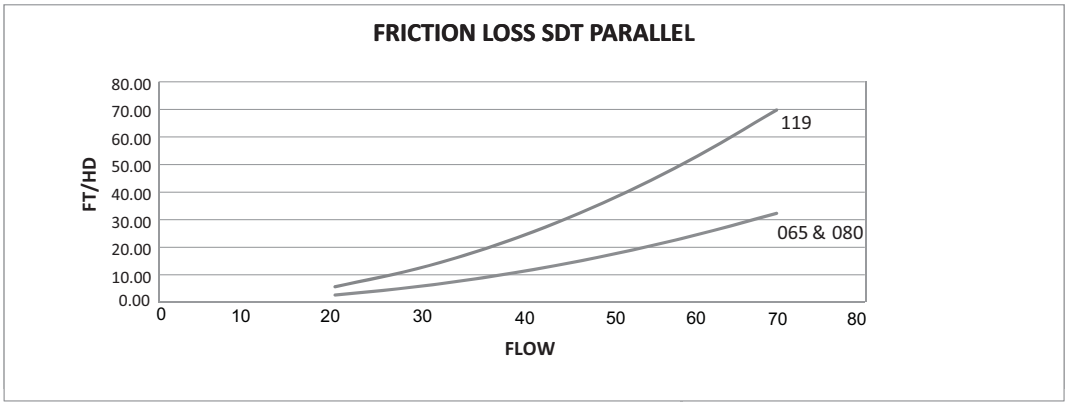
Table 9C
Parallel Configuration

Model	Boiler Flow GPM	Boiler Loop Temperature	Continuous Draw GAL/HR	First Hour Rating GAL	Max Input BTU/HR
SDT065	20	180° F	338	396	269,840
SDT080	20	180° F	344	414	269,840
SDT119	20	180° F	466	567	336,198



NOTICE Please note that these illustrations are meant to show system piping concept only, the installer is responsible for all equipment and detailing required by local codes.

Table 9D *SDT Parallel Friction Loss*



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High Efficiency Water Heaters, Boilers and Pool Heaters
300 Maddox Simpson Parkway
Lebanon, TN 37090
615-889-8900 / Fax: 615-547-1000
www.Lochinvar.com

Revision Notes: *Revision A (ECO C05788) initial release.*

Revision B (ECO C05936) reflects the addition of "High Output Piping" section on pages 25-27, Series and Parallel piping diagrams on pages 26-27, and new friction loss charts for SDT Series and Parallel on pages 26 and 27.

SDT-SET-I-O Rev B
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